NASA SBIR/STTR Technologies

Z1.02-9269 - Rechargeable Lithium Metal Cell

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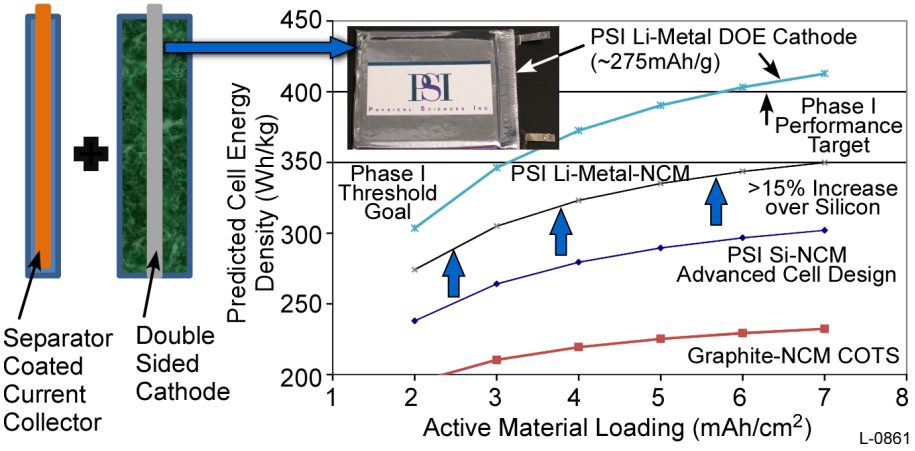
Identification and Significance of Innovation

PSI proposes to develop a rechargeable lithium metal cell with energy density >400Wh/kg. During Phase I, PSI will build pouch cells demonstrating the cycling efficiency of its lithium metal cell design. A specialized electrolyte will be developed that maximizes the cycle life and offers comparable performance to conventional electrolytes designed for graphite cells. A composite separator tailored to efficiently operate with the electrolyte will be used to provide a reduced diffusion distance between the anode and cathode. Phase I testing will demonstrate each component can be scaled to allow the construction of Ah pouch cells. Phase II will focus on building multi amp hour cells that achieve the targeted energy density, 400Wh/kg.

The PSI Lithium Metal Technology together with Advanced DOE Cathodes Increases the Energy Density >70% Over COTS Graphite-NCM Cells while Eliminating Anode Production and Processing Costs and Simplifying Construction



Estimated TRL at beginning and end of contract: (Begin: 2 End: 4)

Technical Objectives and Work Plan

Work Plan:

During the proposed Phase I PSI will:
- Construct and test lithium metal pouch cells.
- Develop a customized electrolyte for use in the cell.
- Develop a composite separator.
- Construct and measure the performance of Ah sized cells.
- Scale-up the relevant preparation techniques.

Technical Objectives:

- Construct pouch sized lithium metal cells and demonstrate the ability to achieve 80% capacity retention over 50 cycles.
- Develop an electrolyte that supports >98% of the C/2 discharge capacity achieved with a carbonate electrolyte.
- Develop a composite separator of <10 microns that supports >98% of the C/2 discharge capacity achieved with a conventional separator.
- Produce 1Ah pouch sized lithium metal cells that will enable energy densities of >400Wh/kg to be achieved on further scale-up.

NASA Applications

The proposed cell technology could be utilized in all NASA battery applications. In particular the rechargeable lithium metal cell technology could be used in any mission or application that requires low mass and low volume. The absence of an intercalation component on the negative electrode allows for higher discharge rate capabilities. Applications include EVA suits, landers, rovers, habitats, vehicle power, and power for payloads.

Non-NASA Applications

The initial market for the proposed technology is military aerospace applications where space is limited and battery energy density is critical. The technology would be well suited to powering microdevices, such as remote sensing devices. The system may be used in emergency power generators and as a replacement for current power sources employing primary and thermal batteries.

Firm Contacts

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